

(0.56, 95%CI 0.48–0.64) ($p < 0.001$). When alignment was used to classify participants, the AUC for KAM impulse (0.69, 95% CI 0.61–0.77) was also significantly greater than the AUC for peak KAM (0.60, 95%CI 0.51–0.68) ($p < 0.05$). There were no differences in the AUCs for KAM impulse and peak KAM when participants were classified using BMLs, cartilage defects or WOMAC pain (Table 1). Based on the ANCOVAs, KAM impulse was significantly different between KL grade and alignment groups, but peak KAM was not different between groups. Both peak KAM and KAM impulse were significantly different between groups based on absence/presence of medial BMLs and cartilage defects. There were no differences in peak KAM or KAM impulse based on WOMAC pain groups (Table 2).

Table 1. AUC (95% CI) for peak KAM and KAM impulse based on clinical and structural disease

	KL Grading	Alignment	Medial BMLs	Medial Cartilage Defects	WOMAC Pain
Peak KAM (%BW×Ht)	0.56 (0.47–0.65)	0.60 (0.51–0.68)	0.67 (0.59–0.75)	0.72 (0.58–0.85)	0.59 (0.5–0.67)
KAM Impulse (%BW×Ht×s)	0.69 (0.61–0.77)*	0.69 (0.61–0.77)*	0.72 (0.65–0.80)	0.72 (0.58–0.85)	0.52 (0.43–0.61)

*Denotes significant difference in AUC between Peak KAM and KAM impulse.

Table 2. Unadjusted and adjusted mean differences in peak KAM and KAM impulse

	Unadjusted	Adjusted for age	Adjusted for height	Adjusted for mass	Adjusted for alignment
KL Grading					
Peak KAM (%BW×Ht)	-0.16 (-0.45, 0.13)	-0.18 (-0.47, 0.12)	-0.19 (-0.48, 0.11)	-0.32 (-0.61, -0.02)*	0.03 (-0.29, 0.34)
KAM Impulse (%BW×Ht×s)	-0.24 (-0.35, -0.13)*	-0.22 (-0.34, -0.11)*	-0.25 (-0.36, -0.13)*	-0.27 (-0.39, -0.16)*	-0.13 (-0.24, -0.12)*
Alignment					
Peak KAM (%BW×Ht)	-0.26 (-0.55, 0.03)	-	-	-0.36 (-0.64, -0.08)*	-
KAM Impulse (%BW×Ht×s)	-0.24 (-0.35, -0.13)*	-	-	-0.26 (-0.37, -0.15)*	-
Medial BMLs					
Peak KAM (%BW×Ht)	-0.52 (-0.39, -0.17)*	-	-0.59 (-0.89, -0.30)*	-	-0.41 (-0.72, -0.09)*
KAM Impulse (%BW×Ht×s)	-0.28 (-0.81, -0.23)*	-	-0.30 (-0.41, -0.18)*	-	-0.18 (-0.29, -0.06)*
Medial Cartilage Defects					
Peak KAM (%BW×Ht)	-0.62 (-1.12, -0.03)*	-	-	-	-0.46 (-1.05, 0.13)
KAM Impulse (%BW×Ht×s)	-0.27 (-0.50, -0.04)*	-	-	-	-0.15 (-0.37, 0.07)
WOMAC Pain					
Peak KAM (%BW×Ht)	0.18 (-0.11, 0.47)	-	-	-	-
KAM Impulse (%BW×Ht×s)	-0.04 (-0.16, 0.07)	-	-	-	-

Dash indicated demographic characteristic was not significantly different between groups and therefore ANCOVAs were not completed. *Denotes significant differences between groups.

Conclusions: Our findings suggest that KAM impulse is more sensitive at distinguishing between OA disease severity than peak KAM. These findings extend those of Thorp et al (2006) who also found that KAM impulse was significantly different between those with mild and moderate OA while peak values were similar between groups. Based on these findings KAM impulse may be a more sensitive measure of medial knee joint loading and future studies investigating biomechanics of knee OA should include KAM impulse along with peak KAM.

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INCREASED DYNAMIC KNEE JOINT LOAD ON THE NON-OPERATIVE LIMB AFTER HIGH TIBIAL OSTEOTOMY

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Purpose: Medial opening wedge high tibial osteotomy (HTO) can correct malalignment of the lower limb in patients with varus gonarthrosis, resulting in decreased dynamic loading of the knee medial compartment. However, varus alignment is often bilateral and the effects of HTO on the non-operative side are presently unclear. The primary objective of this study was to evaluate dynamic knee joint loading in the non-operated limb before and after unilateral HTO.

Methods: Thirty-eight patients who had a mechanical axis angle of at least five degrees varus bilaterally were evaluated before and after undergoing unilateral medial opening wedge HTO. Participants were part of a larger prospective study evaluating the long-term outcomes

of HTO. Full-length, standing antero-posterior radiographs and 3D gait analyses were conducted on the same day before and two years after surgery. The peak external knee adduction moments of both limbs before and after surgery were compared using a two-factor, repeated-measures ANOVA.

Results: In the operative limb, the MAA changed from substantial varus (-10.94 ± 3.72 deg) to very slight valgus (0.21 ± 3.48 deg). There was no change in the non-operative limb before (-8.05 ± 2.51 deg) and after (-8.08 ± 2.71 deg) surgery. There was a significant interaction ($p = 0.01$) between limb and time on dynamic knee joint load (Figure 1). The knee adduction moment significantly decreased on the operative side (mean change; 95% CI = $-1.99\text{BW} \times \text{Ht}$; -2.33 , $-1.65 \text{BW} \times \text{Ht}$), yet significantly increased on the non-operative side (mean change; 95% CI = $0.25 \text{BW} \times \text{Ht}$; 0.03 , $0.46 \text{BW} \times \text{Ht}$). Observed gait characteristics consistent with an increase in load on the non-operative knee included an increase in gait speed (mean change; 95%CI = 0.08 m/sec ; 0.03 , 0.12 m/sec) and a decrease in trunk lean to the stance limb (mean change; 95%CI = -1.43 deg; -2.37 , -0.48 deg).

Conclusions: Although it is unclear if changes in the non-operative limb are due to surgery, these findings do suggest that the dynamic knee joint load experienced by the non-operative limb increases after unilateral HTO.

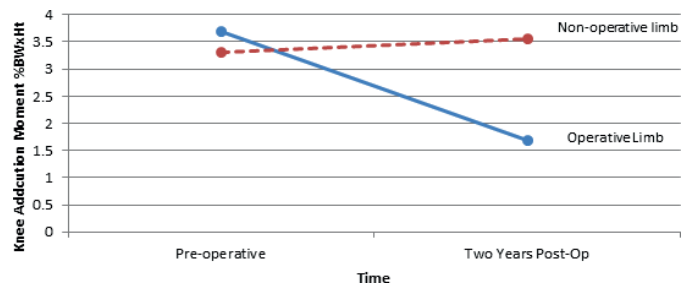


Fig. 1. Peak knee adduction moment for operative (solid) and non-operative (dashed) limbs pre-operatively and 2 years post-operatively.

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GAIT CHARACTERISTICS AND POTENTIAL EFFECT OF SUPERVISED EXERCISE THERAPY IN HIP OSTEOARTHRITIS PATIENTS WITH MILD TO MODERATE PAIN. A RANDOMIZED CONTROLLED TRIAL

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Purpose: Previous studies have shown that patients with hip osteoarthritis (OA) have significant impairments and disabilities. However, few studies have examined gait characteristics in patients with hip OA using motion analysis, and those that exist have primarily concerned severe hip OA. No studies have examined the effect of exercise interventions on gait characteristics in patients with hip OA not eligible for total hip replacement (THR). The aim of this randomized controlled study was twofold: Firstly, to investigate potential differences in gait characteristics during the stance phase of gait between osteoarthritic hip joints and unaffected joints in patients with hip OA with mild to moderate pain. Secondly, to evaluate whether an intervention of patient education (PE) alone or PE combined with supervised exercise therapy for 12 weeks (PE+ET) would affect kinematic and kinetic parameters during the stance phase of gait.

Methods: Inclusion criteria were evident unilateral or bilateral radiographic hip OA using Danielson's criteria with $<4 \text{ mm}$ minimal joint space (MJS) for patients <70 years and $<3 \text{ mm}$ MJS for patients ≥ 70 years, in addition to self-reported hip pain lasting ≥ 3 months and <96 points on the Harris Hip Score (HHS). Subjects with HHS score <60 were considered candidates for THR, and thus excluded. Patients were randomized to either PE ($n = 25$) or PE+ET ($n = 27$) after baseline tests. Motion analyses were performed at baseline and post intervention follow-up at 4 months. Kinematic data were collected using the Qualisys Motion Capture System with eight cameras synchronized with kinetic data captured using three AMTI force plates. Sagittal plane kinematic and kinetic data were calculated using Visual 3D software. Kinematic data during stance phase